

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

CORRECTED VERSION

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
25 March 2004 (25.03.2004)

PCT

(10) International Publication Number
WO 2004/025208 A1

(51) International Patent Classification⁷: F28F 9/26

(21) International Application Number:
PCT/JP2003/010620

(22) International Filing Date: 21 August 2003 (21.08.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2002-240927 21 August 2002 (21.08.2002) JP
60/407,945 5 September 2002 (05.09.2002) US

(71) Applicant (for all designated States except US): SHOWA DENKO K.K. [JP/JP]; 13-9, Shiba Daimon 1-chome, Minato-ku, Tokyo 105-8518 (JP).

(72) Inventors; and

(75) Inventors/Applicants (for US only): SHINMURA, Etsuo [JP/JP]; c/o Oyama Regional Office, SHOWA DENKO K.K., 480, Inuzuka 1-chome, Oyama-shi,

Tochigi, 323-0811 (JP). TAKE, Koichiro [JP/JP]; c/o Oyama Regional Office, Showa Denko K.K., 480, Inuzuka 1-chome, Oyama-shi, Tochigi 323-0811 (JP). OGASAWARA, Noboru [JP/JP]; c/o Oyama Regional Office, Showa Denko K.K., 480, Inuzuka 1-chome, Oyama-shi, Tochigi 323-0811 (JP).

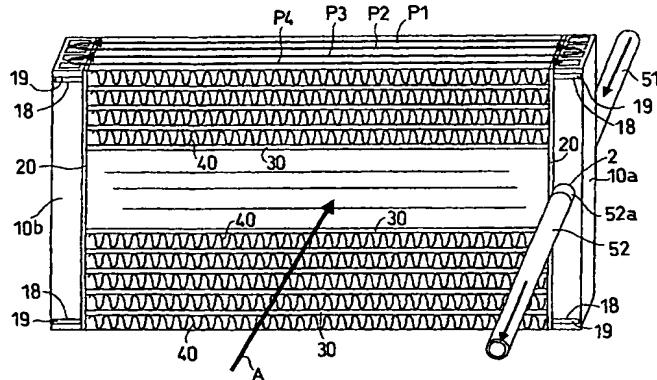
(74) Agents: SHIMIZU, Hisayoshi et al.; Shinsaibashi Iwasaki Bldg., 4-26, Minamisemba 3-chome, Chuo-ku, Osaka-shi, Osaka 542-0081 (JP).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,

[Continued on next page]

(54) Title: HEAT EXCHANGER, METHOD FOR MANUFACTURING HEAT EXCHANGER, TUBE CONNECTING STRUCTURE FOR HEAT EXCHANGER HEADER TANK, GAS COOLER USING SUPERCRITICAL REFRIGERANT, AND REFRIGERANT SYSTEM



(57) Abstract: A heat exchanger according to the present invention includes a pair of header tanks 10a and 10b and a plurality of heat exchanging tubes 30 disposed between the header tanks and arranged in parallel. The header tank 10 and 10b is provided with partitioning walls 15 integrally formed to the header tank along the longitudinal direction. The inside space of the header tank is divided by the partitioning walls 15 into tank portions 11 to 014. Refrigerant turning communication apertures 17 are formed in the predetermined partitioning wall 15. The refrigerant passages 35 of the heat exchanging tube 30 are grouped so as to correspond to each tank portion of the header tank 10a and 10b to thereby form a plurality of passes P1 to P4. The refrigerant introduced into the first tank portion 11 of one of the header tanks 10a passes through each passes P1 to P4 in this order from the rear side toward the front side, and then introduced into the fourth tank portion 14 of the other of the header tanks 10b. According to this heat exchanger, enough pressure resistance and heat exchanging performance can be obtained.

WO 2004/025208 A1



ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(15) Information about Correction:
see PCT Gazette No. 09/2005 of 3 March 2005, Section II

Published:

— *with international search report*

(48) Date of publication of this corrected version:

3 March 2005

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP03/10620

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl' F28F9/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl' F28F9/26

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Japanese Utility Model Gazette 1926-1996, Japanese Publication of Unexamined Utility Model Applications 1971-2003, Japanese Registered Utility Model Gazette 1994-2003
, Japanese Gazette Containing the Utility Model 1996-2003

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT
--

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2001-336896 A (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.) 2001.12.07 (Family:None)	1-19
Y	JP 2000-81294 A (DENSO CORPORATION) 2000.03.21 (Family:None)	1-19

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
16.12.03

Date of mailing of the international search report
13.01.04

Name and mailing address of the ISA/JP
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan

Authorized officer
YOICHI NAGASAKI
Telephone No. +81-3-3581-1101 Ext. 3377
3M 8610